MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON TYPE 1N831A

1. SCOPE

1.1 Scope. This specification covers the detail requirements for a silicon, semiconductor diode for use as a mixer (first-detector stage) device in S-Band (see 4.3.1) equipment circuits.

1.2 Outline and dimensions. See figure 1.

1.3 General performance characteristics.

Operating temperature range: —65° to ± 100°C

Storage temperature range: —65° to ± 150°C

Operating altitude: up to 85,000 ft. (without derating)

1.4 Ratings.

	Z(IF) Ohms	L_C db	NF_o db	VSWR
Min.	350	———	———	———
Max.	450	5.5	7.0	1.3

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

MILITARY

MIL-S-19500 Semiconductor Devices, General Specification For

STANDARDS

MILITARY

MIL-STD-750 Test Methods For Semiconductor Devices

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Both the title and number or symbol should be stipulated when requesting copies.)

FSC 5961

3. REQUIREMENTS

3.1 Requirements. Requirements for the semiconductor diode shall be in accordance with Specification MIL–S–19500, and as otherwise specified herein.

3.2 Abbreviations and symbols. The abbreviations and symbols used herein are defined in Specification MIL–S–19500.

3.3 Design and construction. The semiconductor diode shall be of the design, construction, and physical dimensions specified in figure 1.

3.3.1 *Operating position.* The semiconductor diode shall be capable of proper operation in any position (relative to any orientation of an equipment assembly).

3.3.2 *Polarity indication.* The cathode-terminal end of the semiconductor diode shall be identified by a single, contrasting-color band circumscribed around the body of the device.

3.4 Performance characteristics. The semiconductor diode performance characteristics shall be as specified in tables I, II and III.

3.5 Marking. Unless otherwise specified, marking shall be in accordance with Specification MIL–S–19500. Identification color-coding shall not be used. If any specification-requirements waiver has been granted, the product-identification marking shall consist of the "classification" type-designation only. The "manufacturer's identification" and "country of origin" may, at option of the manufacturer, be omitted from being marked on the body of the semiconductor device covered herein.

4. QUALITY ASSURANCE PROVISIONS.

4.1 General. Except as otherwise specified, the responsibility for inspection, general procedures for acceptance, classification of inspection, and inspection conditions and methods of test shall be in accordance with Specification MIL–S–19500, Quality Assurance Provisions.

4.1.1 Inspection lot. Applicable to the semiconductor device(s) covered herein, the term "inspection lot" shall be as defined in paragraph 4.3.2.1 of Specification MIL–S–19500 except that the 6-week-period time limitation stipulated shall be considered as not compulsory.

4.2 Qualification and Quality Conformance Inspection. Qualification and Quality Conformance inspection shall be in accordance with Specification MIL–S–19500, Quality Assurance Provisions, and as otherwise specified herein. Groups A, B, and C inspection shall consist of the examinations and test specified in tables I, II, and III, respectively. Quality Conformance inspection shall include inspection of Preparation For Delivery (see 5.1).

4.2.1 *Specified LTPD for subgroups.* The LTPD specified for a subgroup in Tables I, II, and III herein shall apply for all of the tests, combined, in the Subgroup.

4.2.2 *Group A sampling—acceptance criteria for Qualification Inspection.* For Qualification inspection, only one failure will be permitted for all Group A tests combined. Upon occurence of one such failure, notification shall be transmitted immediately to the Commanding General, U. S. Army Electronics Command, Fort Monmouth, N.J. 07703, ATT: AMSEL–PP–EM–2. Further Qualification inspection shall not be continued until so authorized from the above-mentioned Government agency.

4.2.3 *Group C testing.* Unless otherwise specified, Group C tests shall be performed on the initial lot and thereafter on a lot every 6 months (see table III). The contractor shall, throughout the course of a

contract or order, permit the Government representative to scrutinize all test data and findings covering manufacturer's test program on Group C characteristics and parameters for the product(s) concerned. Upon determination by the Government inspector (in advance of Group C, 6-month, test results) that Group C parameters are not being adequately met, the Government inspector may require lot-by-lot inspection (normally for a minimum of 3 consecutive lots) to be performed for required Group C tests.

4.2.4 *Disposition of sample units.* Sample units that have been subjected to Group B and Group C tests, these tests to be considered nondestructive, may be delivered on the contract or order provided that after Group B and C inspection is terminated, these sample units are subjected to and pass Group A inspection. Defective units from any sample group that may have passed group inspection shall not be delivered on the contract or order until the defect(s) has been remedied to the satisfaction of the Government.

4.3 Particular examination and test procedures.

4.3.1 *Test conditions.* Unless otherwise specified herein, the following test conditions shall prevail wherever applicable:

$f = 3060 \pm 5$ Mc

$Z_m = 400 \pm 10$ ohms

$R_L = 100 \pm 10$ ohms

$P = 5.0$ mW

4.3.2 *Test holder (or adapter) for tests.* For all tests, the diode shall, as practicable, be affixed to or within a test holder (or adapter) normally used by manufacturer, except that such test holder (or adapter) and its use during any particular test shall be acceptable to the Government inspector. The minimization of any external capacitive or resistive effects on the test setup shall be a primary concern during use of suitable test holders (or adapters). The requirements in this paragraph shall govern in all instances where an applicable test method per Standard MIL-STD-750, as referenced herein, stipulates use or choice of a test holder (or adapter) per "XXX-JAN" drawing.

4.3.3 *Interval for end-point test measurements.* All applicable end-point test measurements shall be performed, after sample units have been subjected to required physical-mechanical or environmental test(s), in accordance with the following time-delay limitations:

(a) For Qualification Inspection: within 16 hours.

(b) For Quality Conformance Inspection: within 96 hours.

4.3.4 *Overall noise figure at high temperature test.* At end of a 5-minute period of subjection to the high temperature specified, and while still at that specified T_A, the diode(s) under test shall be measured for NF_o; the value found shall not exceed 12.0 db. The diode(s) under test shall then be permitted to return to room ambient temperature and, at end of a 15-minute interval, shall again be measured for NF_o; the value found shall not exceed 8.0 db.

4.3.5 *Barometric pressure, reduced test.* This test shall be conducted without any energization of the diodes subjected to the reduced pressure specified. After subjection for the period specified, the diodes shall be tested, within an interval conforming to requirements in 4.3.3, for any of the following characteristics (at option of the manufacturer): conversion loss, output noise ratio, overall noise figure, or IF impedance; and the test conditions established in table I for the particular test shall be applicable. For the particular characteristic selected to

be evaluated, measurement (prior to subjection of the diode to the reduced pressure specified) and record of the value found (required to be within specified test limits) shall have been effected. The value of the test characteristic found after subjection to reduced pressure shall not differ by more than 10 percent from the original recorded value.

4.4 Mechanical damage resulting from tests. Except for intentionally deforming, mutilating, or dismembering mechanical-stress tests to which samples are subjected, there shall be no evidence of mechanical damage to any sample unit as a result of any of the Group A, B, or C tests.

TABLE I. *Group A Inspection.*

Test method per MIL–STD–750	Examination or test	Conditions [1]	LTPD	Symbol	Limits		
					Min.	Max.	Unit
	Subgroup 1		7				
2071	Visual and mechanical examination.						
	Subgroup 2		7				
4146	Burnout by single pulse.	V_R = 125 Vdc, min.					
4136	Voltage standing wave ratio.	I = 1.0 mAdc peak avg.		VSWR		1.3	
4126	Overall noise figure	Test Cond. A;[2]		NF_o		7.0	db
	Subgroup 3		7				
4116	IF impedance	f_{sig} = 60 cps		Z(IF)	350	450	ohms
4101	Conversion loss	Modulation method; [2]		L_C		5.5	db
4121	Output noise ratio	R_e = 400 ohms		NR_o		1.5	(times)

[1] See 4.3.1 and 4.3.2.

[2] Where the formula $NF_o = L_C (N_{if} \pm NR_o - 1)$ is used or applicable, an assumed or actual NF_{if} of 1.5 db shall be employed; however, NF_{if} (actual) shall be determined within ± 0.1 db.

TABLE II. *Group B Inspection.*

Test method per MIL-STD-750	Examination or test [1]	Conditions [2]	LTPD	Symbol	Limits		
					Min.	Max.	Unit
	Subgroup 1		7				
2066	Physical dimensions						
	Subgroup 2		20				
2026	Solderability	Immersion to within 0.1 in. from body.					
1051	Temperature cycling	Test Cond. F					
1021	Moisture resistance	No initial conditioning Vibration per Step 7b.					
	End-point tests:						
4126	Overall noise figure	Test Cond. A; [3]		NF_o		8.0	db
	Subgroup 3		20				
2016	Shock	No voltages 500G 5 blows of 1 msec ea in ea orientation X1, Y1, Z1 (total = 15 blows).					
2056	Vibration, variable frequency.	f = 50 to 2,000 cps Orientations X1, Y1, Z1.					
2006	Constant acceleration (centrifugal).	20,000G Orientations X1, Y1, Z1.					

TABLE II. *Group B Inspection* (Cont'd).

Test method per MIL-STD-750	Examination or test [1]	Conditions [2]	LTPD	Symbol	Limits		
					Min.	Max.	Unit
	End-point tests:						
	Same as for Subgroup 2 above.						
	Subgroup 4		20				
4126	Overall noise figure at high temperature.	T_A = ± 150°C, min [3].	———	NF_o	———	[4]	db
2036	Terminal strength: Tension	Test Cond. A Weight = 2 lbs. ± 0.5 oz. t = 15 seconds.	———	———	———	———	———
2036	Terminal strength: Lead fatigue	Test Cond. E Weight = 1 lb. ± 0.5 oz.	———	———	———	———	———
	End-point tests:						
	Same as for Subgroup 2 above.						
	Subgroup 5	———	10				
1031	High-temperature life, (nonoperating).	T_A = ± 150°C, min t = 500 hrs, min.	———	———	———	———	———
	End-point tests:						
	Same as for Subgroup 2 above.						

[1] See 4.3.3.
[2] See 4.3.1 and 4.3.2.
[3] Rquirements of footnote [2] to table I apply.
[4] See 4.3.4.

TABLE III. *Group C Inspection* [1].

Test method per MIL-STD-750	Examination or test	Conditions [2]	LTPD	Symbol	Limits		
					Min.	Max.	Unit
	Subgroup 1		20				
4141	Burnout by repetitive pulsing.	t_p = 0.05 usec V_F = 15v R_G = 50 ohms [3]	----	----	----	----	----
	Subgroup 2		10				
1001	Barometric pressure, reduced.	Nonoperating Pressure = 15 ± 2mmHg t = 60 sec, min	----	----	----	----	----
	End-point tests						

[1] Periodicity: See 4.2.3.

[2] See 4.3.1 and 4.3.2.

[3] The number of pulses shall be 60,000 minimum, at any pulse repetition frequency.

[4] See 4.3.5.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery. Preparation for delivery and the inspection of Preparation for Delivery shall be in accordance with Specification MIL-S-19500.

6. NOTES

6.1 Notes. The notes included in Specification MIL-S-19500, with the following additions or exceptions, are applicable to this specification.

6.2 Qualification. With respect to products requiring qualifications, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List (QPL)-19500, whether or not such products have actually been so listed by that date. Information pertaining to qualification of products covered by this specification should be requested from the Commanding General, U.S. Army Electronics Command, Fort Monmouth, N.J. 07703, ATTN: AMSEL-PP-EM-2.

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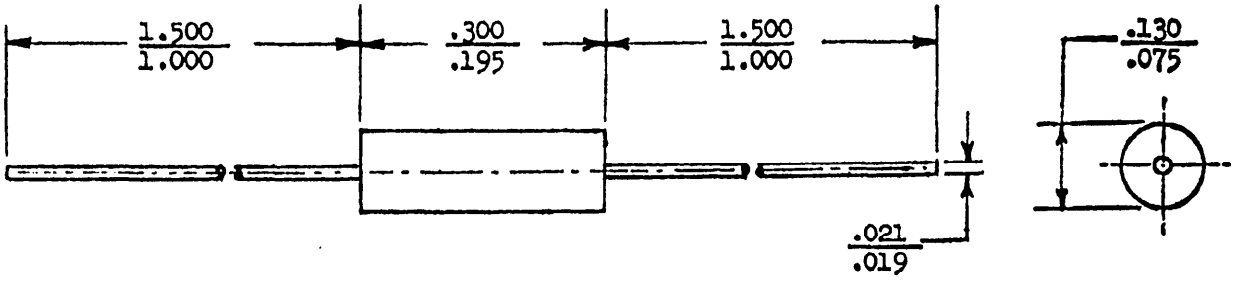

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FIGURE 1. *Outline and dimensions.*

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